Focus. . . Missouri Perinatal Drug Prevalence Study

The perinatal effects of substance use, including alcohol and tobacco, are well documented and include preterm labor, low birth weight, prematurity, congenital anomalies, fetal distress, stillbirth, cerebral infarction, mental retardation and other neurobehavioral effects. These effects are not necessarily drug-specific. Indirect effects result from risk-taking lifestyles, poor nutrition, inadequate weight gain, and absent or inadequate prenatal care. The following study was completed to acquire a baseline of perinatal substance usage for Missouri residents.

Methods

A statewide sample of peripartum women was secured utilizing a multi-stage probability proportional to size sampling design. Missouri's 67 nonmilitary hospitals that experienced a minimum of 200 deliveries in 1991 constituted the sampling frame. These hospitals represented approximately 95 percent of the Missouri births recorded during that year.

The state was divided into three major regions. Within each region, probability proportional to size sampling was performed to randomly select eight hospitals from the St. Louis metro region, five from the Kansas City metro region and nine from outstate. In each region, one public hospital that delivered a large proportion of low income women was included in the study.

The study sample represented 67.1 percent of the recorded births and fetal deaths for the hospitals involved, for their respective study time periods. To ensure that the final realized sample was representative of the defined population, a comparison was made with recorded birth and fetal death records for that time period with regard to the distribution of race, age, Medicaid status and lack of prenatal care. The final realized maternal sample size was 2,213, with 2,008 paired maternal/infant samples.

Data were collected between February and July, 1993. The study population included all women admitted consecutively for delivery at each of the participating hospitals, with pregnancies of 20 weeks or more gestation, and their infants. Each hospital initiated sample collection on a specified date with significant overlap for collection periods among hospitals.

A portion of the routine urine specimen and the infant's meconium stool were obtained for analysis. Demographic data, obstetrical history, including self-reported use of alcohol, tobacco and other drugs (licit and illicit) during pregnancy, prenatal care status and delivery information were abstracted from the hospital medical record. Additional information included delivery outcome, birth weight, estimated gestational age, and prescription medications.

All specimens were analyzed in a laboratory certified by the National Institute on Drug Abuse (University of Missouri, Toxicology Laboratory, Columbia, MO). Laboratory personnel received specimens labeled only with the coded identifiers.

Expansion weights were developed at the hospital level to represent that hospitals' deliveries for two years and to account for over/undersampling. Post-stratification was utilized to conform the sample's racial (black, non-black), birth weight (LBW, not LBW) and pregnancy outcome type (live birth, fetal death) distribution of deliveries to those of the population in the region and state for 1991-1992. SUDAAN (SUrvey DAta ANalysis) was used to calculate the weighted prevalence estimates and standard errors, taking the sampling design into account.

Results

Utilizing chart abstraction for alcohol and urine analysis for all other substances, the overall estimates of statewide prevalence of any (licit and illicit) substance use during pregnancy was 31.9 percent. This estimate includes all of the illicit substances, plus alcohol and tobacco.

The overall estimate of the percentage of women or infants testing positive for one or more illegal substances are presented in Table 1. Based solely upon maternal urine analyses, the overall prevalence of illegal drug usage was 10.8 percent. Infant meconium analyses revealed an overall prevalence of illegal drug use of only 6.2 percent. When both methods are utilized (urine only positive, meconium only positive, plus all paired positives) the prevalence was 13.0 percent.

The acquired prevalence rates, though included in the totals, for opiates, benzodiazepines, amphetamines and barbiturates may be unreliable, due to unreported usage of prescribed medications.

The prevalence of marijuana usage based upon urine analysis was 4.0 percent, which was considerably higher than the prevalence of 1.9 percent in meconium. For cocaine, there was no difference between the urine or meconium analyses (1.3 percent vs. 1.4 percent). To simplify the remainder of the presentation, the subsequent data presented, except alcohol, were obtained from urine toxicological analyses.

The prevalence of alcohol usage was 7.9 percent, as measured by chart abstraction. Prevalence of tobacco usage did not differ greatly between urine cotinine, 21.9 percent and chart abstraction, 22.5 percent.

Except for cocaine, prevalence of substance use varied little by race. White women had higher prevalence rates for tobacco (22.8 ± 4.3 vs. 18.8 ± 4.2) and marijuana use (4.3 ± 1.4 vs. 3.1 ± 1.1), while black women had higher prevalence rates for alcohol (10.0 ± 2.0 vs. 7.4 ± 1.5) and cocaine (5.9 ± 2.0 vs. 0.3 ± 0.2). The only statistically significant ($P<0.05$) difference between the groups was for cocaine usage. The prevalence rate among black women was nearly twenty times higher than the corresponding rate for white women.

Prevalence estimates in relation to maternal age are presented in Table 2. The lowest drug prevalence estimates were noted for adolescents 12-19 years of age. Alcohol usage increased with age, with the prevalence estimates for the 25-29 and 30-44 age groups being significantly higher than the corresponding rates for ages 12-19. In addition, the prevalence of alcohol usage for women ages 30-44 was significantly higher than for women in the 20-24 age group.

The estimate of prevalence of cocaine usage among all women in the study initially increases with the age of the mother, from 0.3 percent for adolescents ages 12-19, to 2.0 percent for women in the 25-29 age range. The prevalence estimates for women in the 25-29 and 30-44 age groups are significantly higher than the prevalence in adolescents. These trends by age for cocaine usage do not accurately represent white women, due to their low prevalence. For black women, the estimate of prevalence of cocaine usage increases with the age of the mother, from a low of 0.5 percent for adolescents to a high of 13.5 percent for women in the 25-29 year old range. Prevalence then decreases to 11.7 percent for women 30-44 years of age.

The highest prevalence rate for marijuana was noted for women in the 20-24 year old age range, with no significant trend according to age. The highest prevalence for tobacco use also was noted for the 20-24 age range, which was significantly higher than the 12-19 age group.

Table 3 shows the relationship between level of prenatal care and substance use. For alcohol, tobacco, cocaine and marijuana, usage is most prevalent for women who received no prenatal care. Of those women who did not receive prenatal care, over one-third admitted using alcohol and nearly one-half used tobacco, with nearly one in four using cocaine and over one in ten using marijuana. Alcohol, tobacco and cocaine usage were significantly higher for women having no prenatal care than for those receiving some prenatal care, regardless of trimester of entry. For all substances, entry into care in the first trimester was associated with the lowest prevalence rates. The prevalence estimates for alcohol, tobacco and marijuana for first trimester entry into care were significantly lower than those for entry during the second trimester.

The effects of substance use on birth weight overall and by race are presented in Table 4. The prevalence estimates for all four substances are significantly higher for women who delivered infants weighing <2500 grams (low birth weight). One in three women delivering low birth weight infants used tobacco, nearly one in six used alcohol, one in twelve used marijuana, and one in twenty used cocaine. For white women, only the prevalence estimate for marijuana was significantly higher for women delivering low birth weight infants. However, for black women the prevalence estimates for alcohol, tobacco and cocaine were significantly higher for women having low birth weight infants.

Prevalence estimates also were calculated for expected payment source, region of residence, prior live births and prematurity. The prevalence estimate for tobacco was significantly higher ($P<0.05$) for the Medicaid and self-pay groups than for women who had private insurance. Prevalence estimates for marijuana and cocaine also were significantly higher ($P<0.05$) for Medicaid than for the private insurance group. Significantly higher ($P<0.05$) prevalence estimates for alcohol and cocaine were found for the St. Louis and Kansas City metro areas than for outstate Missouri. Women having three or more previous live births had significantly higher prevalence estimates for tobacco and cocaine than women having fewer previous live births. Alcohol and cocaine use were significantly higher in deliveries that occurred prior to the 37th completed week of gestation.

Discussion

Missouri law requires that all prenatal care providers assess pregnant women for the risk and current use of alcohol, tobacco and other substances, and to provide education regarding their effects on pregnant women and their fetuses. Verification of assessment and education must be documented in the prenatal record. The information recorded in the prenatal record is generally transferred to the hospital medical record, at the time of delivery. Self-reported maternal alcohol and tobacco use are recorded on birth certificates, as well. Concerns regarding self reported substance use have been documented to include denial of addictive behavior, fear of discovery, prosecution, or shame. However, the potential exists for more accurate reporting of licit substances such as tobacco, as demonstrated by our birth certificate information.

Our study results highlight the need for a balanced, broad-based approach to substance use during pregnancy in Missouri. Professional education regarding risk factors related to substance use during pregnancy must address the need for early and repeated assessments and the necessity of early intervention. Treatment and other targeted interventions for regional or ethnic variations in substance use can be established based upon this study.

The impact of substance use upon perinatal outcome has been well established by earlier studies. The potential impact for the nearly 24,000 Missouri infants exposed per year to substances during pregnancy commands attention to the development of appropriate public policy and professional intervention.

Note: This Focus is a condensed version of the article "Prevalence and Implications of Perinatal Substance Use in Missouri" published in the June 1996 issue of Missouri Medicine (93:6 292-299) and was supported by Missouri general revenue funding and in part from funding received through the Missouri Department of Mental Health, Division of Alcohol and Drug Abuse.

Table 1

Overall Prevalences of Antepartal Drug Exposure based on Different Sources

(Missouri 1993 Perinatal Substance Abuse Study)

	Chart		*Urine*		*Meconium*	
	%	CI (±)	%	CI (±)	%	CI (±)
Alcohol	7.9	1.3	—		—	
Tobacco	22.5	3.4	21.9	3.6	—	
Marijuana	1.3	0.5	4.0	1.1	1.9	0.8
Cocaine	1.1	0.5	1.3	0.6	1.4	0.7
Phencyclidines	—		0.02	0.04	0	—
Any drug	25.7	3.4	28.1	3.7	6.2	1.4
Illegal drugs	2.0	0.7	10.8	2.5	6.2	1.4
N	2,213		2,213		2,008	

*CI-Confidence interval

Table 2

Weighted Age-Specific Prevalence of Antepartal Drug Exposure Based on Urine Testing (Missouri 1993 Perinatal Substance Abuse Study)

	Ages 12-19 (1)		*20-24 (2)*		*25-29 (3)*		*30-44 (4)*	
Drug	*%*	*CI (±)*	*%*	*CI (±)*	*%*	*CI (±)*	*%*	*CI (±)*
Alcohol*	4.0	2.1	6.6	1.8	7.9 (1)	2.1	11.4 (1, 2)	3.4
Tobacco	17.1	4.8	25.2 (1)	4.8	22.0	5.3	20.7	4.4
Marijuana	3.4	2.3	5.2	2.4	3.5	1.9	3.8	1.8
Cocaine	0.3	0.4	0.9	0.6	2.0 (1)	1.3	1.5 (1)	1.0
Sample size	404		666		564		566	

*From chart review.

The number(s) in parentheses indicate the group with prevalence estimates significantly lower (P<0.05) than the estimate for the group shown at the head of the column.

Table 3

Weighted Prenatal Care-Specific Prevalence of Antepartal Drug Exposure Based on Urine Testing (Missouri 1993 Perinatal Substance Abuse Study)

	Trimester Care Began									
	First (1)		*Second (2)*		*Third (3)*		*No Care (4)*		*Unknown Care (5)*	
Drug	*%*	*CI (±)*	*%*	*CI (±)*	*%*	*CI (±)*	*%*	*CI (±)*	*%*	*CI (±)*
Alcohol*	6.6	1.5	10.1	2.3	12.2	7.9	33.8	12.6	9.1	5.1
			(1)				(1, 2, 3, 5)			
Tobacco	18.9	3.8	27.0	5.2	24.2	10.1	49.2	12.9	32.5	7.8
			(1)				(1, 2, 3, 5)		(1)	
Marijuana	3.1	1.3	6.4	2.5	5.3	4.4	10.3	9.0	5.9	3.4
			(1)							
Cocaine	0.5	0.4	1.6	1.6	5.9	4.2	23.3	12.5	1.9	1.6
			(1)				(1, 2, 3, 5)			
Sample size	1,476		390		94		58		195	

*From chart review.

The number(s) in parentheses indicate the group with prevalence estimates significantly lower (P<0.05) than the estimates for the group shown at the head of the column.

Table 4

Weighted Birth Weight-Specific Prevalence of Antepartal Drug Exposure Based on Urine Testing by Race (Missouri 1993 Perinatal Substance Abuse Study)

	All Races				*White*				*Black*			
	LBW		*Not LBW*		*LBW*		*Not LBW*		*LBW*		*Not LBW*	
	%	*CI*	*%*	*CI*	*%*	*CI*	*%*	*CI*	*%*	*CI*	*%*	*CI*
Alcohol*	16.5**	4.5	7.2	1.3	9.4	5.9	7.2	1.5	23.5**	10.8	7.9	2.0
Tobacco	32.9**	10.3	21.0	3.7	30.6	13.1	22.3	4.4	36.5**	16.5	16.1	3.8

Marijuana	8.2**	4.3	3.7	1.0	10.5**	6.1	3.9	1.3	5.1	5.9	2.8	0.9
Cocaine	5.0**	3.3	1.1	0.5	1.2	2.3	0.2	0.2	12.3**	7.3	5.0	1.7

*From chart review.
**Significantly higher ($p<0.05$) than the not LBW group.

Provisional Vital Statistics for May 1996

Live births increased in May as 6,286 Missouri babies were born compared with 5,393 in May 1995. The birth rate increased from 12.0 to 14.3 per 1,000 population.

Cumulative births for the 5- and 12-month periods ending with May also show slight increases. For the first five months of 1996 there were 30,592 births compared with 30,248 during the similar time period in 1995.

Deaths increased in May as 4,543 Missourians died compared with 4,168 one year earlier. Cumulative deaths for the 5- and 12-month periods ending with May also show increases.

The **Natural increase** for Missouri in May was 1,743 (6,286 births minus 4,543 deaths). This represents an increase for May, but a decrease for the cumulative 5- and 12-month time periods.

Marriages decreased for all these time periods shown below.

Dissolutions of marriage decreased in May, but increased for January-May and the 12 months ending with May.

Infant deaths decreased for all three time periods shown below. For January-May the infant death rate was 7.7 per 1,000 live births compared to 8.3 one year earlier.

Provisional Resident Vital Statistics for the State of Missouri

	May				Jan.-May cumulative				12 months ending with May				
Item	Number		Rate*		Number		Rate*		Number			Rate*	
	1995	1996	1995	1996	1995	1996	1995	1996	1995	1996	1994	1995	1996
Live Births	5,393	6,286	12.0	14.3	30,248	30,592	13.6	13.9	73,651	73,919	14.6	13.9	13.9
Deaths	4,168	4,543	9.3	10.4	23,696	24,338	10.7	11.0	53,392	54,511	10.3	10.1	10.2
Natural increase	1,225	1,743	2.7	4.0	6,552	6,254	3.0	2.8	20,259	19,408	4.3	3.8	3.5
Marriages	4,701	3,779	10.5	8.6	15,474	14,892	7.0	6.7	45,018	44,475	8.4	8.5	8.3
Dissolutions	2,358	2,212	5.2	5.0	10,497	11,306	4.7	5.1	25,677	26,535	5.1	4.8	5.0
Infant deaths	57	40	10.6	6.3	251	242	8.3	7.7	599	544	7.7	8.1	7.4
Population base (in thousands)	...	...	5,323	5,352	...	...	5,323	5,352	...	...	5,252	5,209	5,333

*Rates for live births, deaths, natural increase, marriages and dissolutions are computed on the number per 1000 estimated population. The infant death rate is based on the number of infant deaths per 1000 live births. Rates are adjusted to account for varying lengths of monthly reporting periods.